

UPGRADE
WORKSHOP

INTRODUCTION

A wireless network promises much greater convenience than linking all your computers together with wires. With an effective wireless network, you needn't be tethered by an Ethernet cable to your broadband router for tasks such as accessing the internet, sharing files between multiple computers or simply printing documents to a network printer. But although wireless networking can be liberating, it can also be frustrating. Walls, floors and furniture all have an effect on a wireless signal, and it's common to have problems getting a reliable, fast connection from certain areas.

You might think there's little that can be done to remedy this, but there are some easy, inexpensive ways to improve the signal on your wireless network. In this month's *Upgrade Workshop*, we'll show you two methods to strengthen the coverage in your home and extend your wireless range. By following our guide, you'll get the most from your wireless network while avoiding the potential pitfalls.

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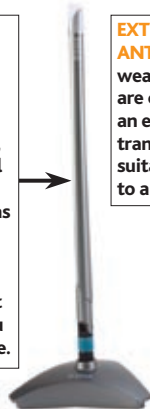


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Boost your wireless

Certain parts of your home may not allow a strong or constant wireless signal. Alan Lu shows how to enhance network coverage

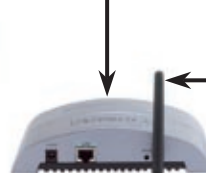
INTERNAL, OMNI-DIRECTIONAL ANTENNA High-gain pole antennas are suitable for a router, repeater or computer, and broadcast a signal in a fairly uniform field. Internal antennas such as this may have a short cable and no means of wall mounting. They aren't weather-proof, so you can't use them outside.



EXTERNAL, DIRECTIONAL ANTENNA External antennas are weather-proof and rugged, and are designed to be mounted on an external wall. This example transmits in a wide arc, so it's suitable for extending coverage to a patio or other wide space.



WIRELESS REPEATER A repeater receives, amplifies and retransmits the signal from your wireless router, extending the range but reducing the throughput to connected devices. This example also has one wired port for plugging in a network device.



REMOVABLE ANTENNA Most wireless devices come with a simple stub antenna. This can often be removed by unscrewing its collar, leaving you free to connect a more efficient or specialised replacement.

There are two principal methods for improving the coverage of a wireless network. Which you choose depends on your needs and on the wireless gear you already have. The cheapest, simplest option is to upgrade the antenna on your router. You may also be able to do this on your wireless adaptors. PCI adaptors for desktop PCs and some CardBus adaptors for notebooks have antenna sockets, too.

GETTING STARTED

Before buying an antenna, check it's suitable for your wireless equipment; see the Compatibility checklist below. An antenna's specifications tell you the amount (in dBi) by which it boosts your wireless signal. Check your router or repeater's specifications for its output power, in dB. Add the figures together to find a total output. Higher figures give you better coverage, but the total must be below 20dB to avoid breaking UK law.

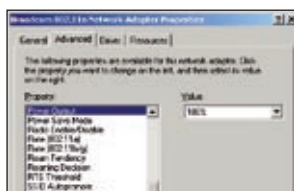
If you just need to extend the range of your wireless network in a specific direction, such as down a long hallway or across the space between two buildings, choose a unidirectional antenna. These concentrate

a powerful signal in a comparatively narrow angle.

You can also use a unidirectional antenna on a single wireless device with a weak signal; just point it towards your router. If you need to improve your coverage in all directions, choose an omni-directional antenna instead. Both antennas are available in indoor and outdoor versions. Outdoor antennas are ruggedised to withstand the elements and can be wall mounted.

Alternatively, you can extend your network's range using another wireless device. If your existing router has support for the wireless distribution system (WDS), you can extend its range by using it in conjunction with another WDS-compatible router. Check your router's documentation, configuration utility or web-administration interface to see if it supports WDS. Unfortunately, WDS isn't a standard agreed by the WiFi Alliance, so different manufacturers may implement it slightly differently. This means WDS-compatible routers from different manufacturers may not work with each other. We recommend that you choose a WDS router from the same manufacturer as your current router, preferably the same model.

Compatibility checklist



LOW TRANSMIT POWER

Check that any radio power setting in your router's web interface is at maximum and that any extended range mode is enabled. Check a wireless adaptor's transmit power by right-clicking its icon in Network Connections and choosing Properties. Click Configure and check the Advanced tab. Or use any manufacturer-provided utility.

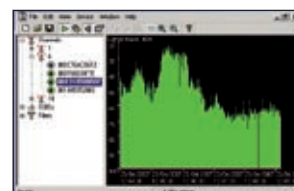
CHECKED



REMOVABLE ANTENNAS

Although the antennas on some products can't be removed, you can unscrew the antenna from many wireless routers and adaptors. SMA antenna sockets, known as RP-SMA or RSMA (above left), are most common. Some products use the larger TNC or RP-TNC (above right) connectors. But these are rare, and you can buy an SMA-to-TNC adaptor cable. Check it will fit your equipment before you buy.

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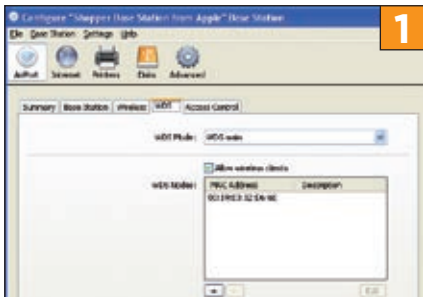


LOCATION, LOCATION

Before buying a wireless repeater or WDS-capable router, find where to put it. Download NetStumbler (www.netstumbler.com) and run it on a wireless-equipped XP notebook. Walk around and use the signal strength information to detect where your network's signal drops to roughly -70dBm or less. This is where you should put your wireless repeater or second WDS router.

CHECKED





Routers that don't support WDS may support wireless bridging, which uses two wireless routers to link two wired networks. This can be a cost-effective way to connect two small offices on separate sites. However, bridged routers won't accept connections from other wireless devices, so this method can't be used to increase your wireless network's coverage. If your existing router doesn't support WDS you can use a wireless repeater, also known as a wireless range extender, to expand the range of your network. Some work only with routers from the same manufacturer, while others claim to work with a wide number of models. As with WDS, we recommend you choose a repeater from the same manufacturer as your router, if available.

Remember that when connected to your wireless network using a WDS router or wireless repeater, your network throughput is reduced, resulting in slower file transfers.

INSTALLATION

If you're just adding a new antenna to one or more wireless devices, go straight to Step 3, then follow our Testing and troubleshooting advice below. Remember that you can combine new antennas with either a wireless repeater or WDS router if it proves necessary.

Before you install a router or repeater, make a note of its unique Media Access Control (MAC) address, and the MAC address of your existing router. You'll need these to help identify devices during the configuration stage. MAC addresses should be printed on each wireless device and on its box or setup sheet. Some wireless routers may have two MAC addresses, one each for the wired and wireless interfaces.

Some routers and repeaters can be configured over a wireless connection, but it's best to use a wired connection to your PC for the initial setup. We recommend that you save the

configuration of your existing router to your PC before making any changes. Check in the router's manual or help file for instructions.

1 INSTALLING A WDS ROUTER

Unless you have two identical routers, configuring each is likely to be slightly different. However, most routers have a web-based configuration interface. You'll find the address and default login information for this in the router's documentation. WDS is turned off by default, so you must find the option to enable it on both routers.

For WDS to work, both routers must have the same network name, called the service set identifier (SSID), and the same WiFi-protected access pre-shared key (WPA-PSK) password. Both should also be configured to use the same radio channel. WDS routers identify each other by their MAC addresses. If the setup utility or web-configuration interface for your WDS router doesn't automatically detect your other WDS router, you'll have to enter the MAC address yourself, repeating the process on each router.

When making any changes to a wireless router, remember to save them on each separate page of the configuration interface by clicking the save or apply button, which may cause the router to reboot. You can't verify that your WDS network has been set up without relocating your new router to the location you identified in Step 3 of the Compatibility checklist; proceed to Testing and troubleshooting for further help.

2 INSTALLING A WIRELESS REPEATER

Installing a wireless repeater is similar to installing a WDS router. Each model is slightly different, but most are configured using a setup utility, a web-configuration interface, or both. As with WDS routers, a wireless repeater must share

the same SSID, radio channel and WPA-PSK password as the router it is extending. Some wireless repeaters are able to detect the SSID and radio channel settings of an existing router, but you'll need to supply the password.

Some wireless repeaters are incompatible with routers that have their WPA-PSK passwords encrypted using both the AES and TKIP methods. You may have to reconfigure your router to use one or the other. As with a WDS network, you can't verify that a wireless repeater is working without relocating it to the place you identified in Step 3 of the Compatibility checklist; proceed to Testing and troubleshooting for further help.

3 INSTALLING ANTENNAS

Installing a replacement antenna is as simple as unscrewing the existing antenna and screwing on your new one. It should be easy to loosen the thumbscrew connector by hand. If it isn't, be sure your antenna really is removable before you use any kind of force.

If you're going to mount an outdoor antenna on a wall or pole, ensure you have the permission of the building owner and consider factors such as planning permission and any potential sources of interference. Unless you're experienced with DIY, it might be worth having the installation done professionally, especially if you have to drill through external walls. While most routers have an SMA antenna socket, outdoor antennas often use TNC connectors. They often come with a suitable adaptor; if not, you can buy one from www.maplin.co.uk for as little as £3.

Position any antenna carefully and point a unidirectional one in the right direction; read Testing and troubleshooting for further help. If you're going to install several antennas in a large office, you should consider having a professional wireless site survey to help with positioning, antenna selection and other issues. 

Testing and troubleshooting

Test that you have successfully extended your wireless range by using your notebook to access your network from a place where it was previously inaccessible. If you added a new antenna to either your router or your computers, use NetStumbler to see if your signal has improved.

The strength of a wireless network signal is measured in dBm. A higher dBm rating indicates a stronger signal, so a -50dBm signal is more reliable than a signal of -80dBm.

Try connecting one computer to your router by Ethernet cable and copying 100MB or so of files from it to your notebook. Speeds vary widely depending on the equipment and environment, but anything above 1MB per second is good for an 802.11g network.

TROUBLESHOOTING

If one WDS router can't detect or be detected by the other router, ensure that only your main router is acting as a DHCP server and has its firewall enabled. Also check that MAC address filtering isn't enabled on either router. If your wireless repeater doesn't appear to be working, use its configuration utility to check it has leased an IP address from your router. You may have to specify an IP address manually, but remember to add a corresponding reservation on your router.

Some Draft-N routers, such as Apple's Airport Extreme, may offer a 5GHz-only radio mode. If you can't enable WDS using this setting, try again after changing the radio mode. If you're experiencing problems configuring WDS routers, ensure both have up-to-date firmware. If you

need to update a device, carefully check the firmware release notes first and follow the manufacturer's instructions exactly.

If your upgrades are successful but you still experience poor reception or slow file transfers, try moving your router, wireless repeater or antennas away from walls or large metal objects. Turn off or move any Bluetooth devices, cordless phones or microwave ovens.

Neighbouring wireless networks can cause interference. Use NetStumbler to identify the channel and signal strength of nearby networks and change the channel of your network away from neighbours. Channels 1, 6 and 11 are ideal, as they have minimal overlap with other channels. Increasing the transmit power, as in the Compatibility checklist, can also help.